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ABSTRACT

Using experimental narratives in which discourse order and event order were not confounded, a study investigated the role of global discourse organization on the comprehension of narrative texts. Subjects, 100 college students, listened to tape recorded passages representing five types of discourse organization: canonical, backward, flashback, embedded, and flashforward. Passages consisted of an underlying event sequence, and used a narrative text with different discourse organizations which violated different principles. After listening to the passage twice, subjects answered 20 true-false comprehension questions about the order of events in the underlying even sequences of the passage. Results showed strong effects of global narrative organization on discourse comprehension, and supported the four principles of discourse organization as applied to narrative text: the immediate integration principle, the consistency principle, the completeness principle, and the isomorphism principle. (The five experimental passages and 40 references are appended.) (MM)

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DISCOURSE ORGANIZATION IN THE COMPREHENSION OF NARRATIVE TEXTS

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May 1988

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Abstract

The present study investigates the role of global discourse organization on the comprehension of narrative texts. We distinguish between the underlying events and the linguistic representation of these events in a text. We propose four principles of discourse organization: (a) the immediate integration principle; (b) the consistency principle; (c) the completeness principle; and (d) the isomorphism principle. There were five types of experimental passages designed to test the principles. The passages were presented auditorily, and the subjects' comprehension of the underlying event order was tested. There were strong effects of global discourse organization on comprehension. The order of passage difficulty was (easiest to difficult): canonical, backward, flashback, embedded, and flashforward. The results support the principles as applied to the comprehension of narratives.

DISCOURSE ORGANIZATION IN THE COMPREHENSION OF NARRATIVE TEXTS

The purpose of the present experiment is to investigate the role of global discourse organization on the comprehension of narrative texts using experimental narratives in which discourse order and event order were not confounded. In order to study global discourse structure, we believe that it is necessary to make a clear distinction between the events in the underlying event world and the linguistic representation of these events in a narrative text. The organization of the events in the underlying event world will be referred to as the *event structure*, and the temporal arrangements of these events in the text will be referred to as the *discourse structure*. For example, given an underlying event sequence such as, SARA SAW A BEAR, SARA WALKED THROUGH THE TREES, SARA SAW A CAMPFIRE, one could organize these events into a text such as, "Sara saw a bear. After this, she walked through the trees. Next she saw a campfire." Or the same events could be organized into a text such as "Sara saw a campfire. Right before she saw the campfire, Sara had walked through the trees. Immediately before this, she had seen a bear."

Event Structure Versus Discourse Structure

Humanities. Scholars in the humanities interested in the structure of text have frequently made a distinction between the structure of events and the structure of narrative. The Russian Formalists (e.g., Tomashevsky, 1925/1965) were very clear on this point; they referred to the underlying events as the *fabula* and the events as ordered in the text as the *syuzhet* (see Erlich, 1980, for additional detail). The distinction has continued to play an important role in the analysis of narrative by Structuralist scholars. Thus, the French Structuralist, Genette (1972/1980) uses the terms *histoire* and *recit*, while the American Structuralist, Chatman (1978) uses the terms *story* and *discourse*. The scholars in this literary tradition make a number of compelling arguments for this distinction. They have pointed out that: (a) there must be a conceptual distinction between a (real or imagined) event and the linguistic description of the event; (b) the same sets of underlying events have been arranged by different authors into very different narratives; and (c) without this distinction one cannot give an appropriate analysis of common narrative conventions such as "flashbacks" and "flashforwards."

Psychology and cognitive science. Researchers in psychology have been slower to make a distinction between event structure and discourse structure. The first recent investigation of the global aspects of narratives was the attempt to write story grammars for narrative text. Initially researchers in this area focused their attention on how higher-order knowledge concerning the "structure" of stories facilitates narrative text comprehension and memory. For example, story grammars were proposed as attempts to describe the higher-order "structure" that is used to encode, represent, and retrieve information from narratives. The initial papers in this tradition (Mandler & Johnson, 1977; Rumelhart, 1975; Stein & Glenn, 1979) did not make a consistent distinction between the structure of the underlying events and the structure of the narrative text. However, more recent papers (e.g., Johnson & Mandler, 1980) have postulated a number of "transformational" rules which embody a distinction somewhat like that between event structure and discourse structure. A number of other theories of global discourse structure have made a clear distinction between underlying events and the discourse presentation of events. Some of these theories (Brewer & Lichtenstein, 1981, 1982; van Dijk, 1976, 1977) were explicitly influenced by the work on text in the humanistic tradition, while for other theories (Johnson-Laird, 1980, 1983) the distinction arose out of an independent analysis of the nature of mental representation. Researchers in the area of artificial intelligence have also contributed to the development of theories of discourse comprehension. However, story understanding programs in artificial intelligence have not tended to incorporate the distinction between the underlying event structure and the surface discourse structure (see Brewer, 1982, for details).

Discourse Organization and Affect

Most of the work in the humanities that distinguishes between event structure and discourse structure has focused on analyzing why authors choose to arrange a particular discourse in a particular way. Thus, the Russian Formalists gave examples of literary texts in which the relation of the discourse structure to the underlying event structure was designed to produce suspense or surprise (cf. Lemon & Reis, 1965). The analysis of these affective or aesthetic functions of event/discourse organization remains a major topic in current structural approaches to literature (Sternberg, 1978). Recently Brewer and Lichtenstein (1981, 1982) have proposed a psychological theory of stories which uses the relation of discourse structure to event structure as a core theoretical construct. This theory gives a detailed account of how particular forms of discourse organization lead to particular affective responses in readers. Thus, most of this earlier theoretical and empirical work focuses on the affective or aesthetic consequences of particular event/discourse relationships, not on comprehension.

Discourse Organization and Comprehension

However, Brewer has argued that the event/narrative distinction should play an important role in understanding how global discourse organization affects text comprehension (Bock & Brewer, 1985, pp. 55-60; Brewer, 1980, pp. 229-233; Brewer & Lichtenstein, 1982, pp. 476-477). Brewer assumes that discourse comprehension should be viewed as a process in which a writer/speaker expresses a mental model of the world in discourse form and then a reader/hearer attempts to extract the mental model from the discourse. Within this framework successful comprehension occurs when the reader constructs a mental model from the text that contains the essential aspects of the writer's original mental model (cf. Johnson-Laird, 1983).

Obviously, the overall process of text comprehension is very complex and includes many levels of analysis. To extract the writer's mental model the reader has to analyze the text at the levels of orthography, word meaning, syntax, propositions, and so forth (Bock & Brewer, 1985; Just & Carpenter, 1977; van Dijk & Kintsch, 1983). However, in this paper, we focus on the impact of *global discourse structure* on text comprehension. Brewer (1980) has pointed out that the author of a text has a number of fundamental options in organizing the discourse structure with respect to the underlying event structure. For example, the author can omit information from the discourse structure and thus leave the reader to make bridging inferences to recover the underlying sequence of events. Another important option that is available to authors is the ability to arrange the underlying events in the text in essentially any order that the author wishes. If the reader is to comprehend a narrative text, the reader must be able to derive the underlying event sequence from the given text sequence. It is this process of deriving underlying models from text that is the focus of this study. In particular, we investigated the effects of global discourse organization of narrative texts on comprehension.

Experimental Studies of Event and Narrative Structure

The initial set of experimental studies on global narrative organization were the studies of Kintsch, Mandel, and Kozminsky (1977); Stein and Nezworski (1978); and Thorndyke (1977). These experiments showed that narrative texts with sentences (or paragraphs) in random order are harder to comprehend or remember than are the original passages. These studies are powerful demonstration experiments showing that there are structures beyond the level of individual sentences that play a role in text comprehension and memory; however, they are not analytic with respect to what is causing these effects.

The experiments were developed and interpreted without taking into account the distinction between event structure and discourse structure. Simply randomizing the order of sentences or paragraphs in a passage confounds these two aspects of discourse since it produces changes in both the discourse

structure and the underlying event structure. Another problem with these studies is that they used narratives which described script or plan-based events (Lichtenstein & Brewer, 1980; Schank & Abelson, 1977). Some of these underlying event types have much more structure than others so that the comprehension difficulty in these studies is probably related to degree of constraint imposed by the different structures. The greater the degree of underlying structure, the easier it should be for the subjects to put the randomized pieces back together. This interpretation is supported by the fact that there were strong effects of passage type (which expressed different types of underlying structure) in both the Thorndyke (1977) and the Kintsch et al. (1977) studies.

The final difficulty with these experiments relates to the issue of discourse cohesion. Natural languages contain a wide variety of linguistic structures which are used to establish coreference across sentence boundaries (Halliday & Hasan, 1976). The procedure of taking the sentences in a linguistically cohesive text and moving them around also manipulates this aspect of discourse. For example, in the sample narrative text given earlier in this paper the following sequence occurs: "Sara saw a bear. After this, she walked through the trees." In this cohesive text the linguistic marker "after this" is used to establish that, at the level of events, SARA WALKED THROUGH THE TREES occurred after the event SARA SAW A BEAR. Clearly if the sentence "After this, she walked through the trees" were moved randomly to some other location in a text, it would lead the reader to establish a wrong coreference or to be unable to identify any coreferent. As a result, the reader would construct a mental model which does not correspond to the event structure intended by the author. Thus, the designs used in these reordering studies also include effects on comprehension due to a disruption of linguistic cohesion as an additional confounding variable. In fact, Garnham, Oakhill, and Johnson-Laird (1982) have carried out a study explicitly directed at this issue and have shown that establishing referential continuity has a strong independent effect on comprehension and memory.

Experimental Studies of Discourse Organization

This review of studies on event and discourse organization shows that in order to understand the impact of discourse organization on text comprehension it is necessary to avoid confounding discourse organization with the other aspects of global text structure. The problem of linguistic cohesion is relatively easy to solve. One can simply make sure that the experimental materials make appropriate use of the linguistic devices that establish coreference.

However, separating the influence of event structure from discourse structure is somewhat more difficult. One solution to this problem is to use texts which contain purely model-based underlying structures instead of schema-based structures. Brewer (1987) has argued that these two types of global knowledge structures can be distinguished in terms of when the knowledge structure is constructed: Schemas refer to prestored generic information, whereas models are constructed at the time of input.

As an extreme example of the problem with using schema-based structures, imagine an experiment on narrative structure in which the underlying event sequence in the text is a restaurant script (e.g., "Fred gave his order to the waiter. Fred ate his salad."). Suppose comprehension or memory experiments are carried out using this text and show that the reader knows that in the underlying event FRED ATE HIS SALAD occurred after FRED GAVE HIS ORDER TO THE WAITER; it is not obvious whether one is actually testing narrative text comprehension because the order information is also available from generic knowledge about restaurants in long-term memory. However, if a model-based text (e.g., "Fred mailed the letter. Later Fred got a haircut.") is used and testing shows that the reader knows that in the underlying event sequence FRED MAILED THE LETTER occurred before FRED GOT A HAIRCUT, then the information must have been obtained by comprehending the given narrative text because the order infromation is not available from prestored generic knowledge in long-term memory. Most of the early studies that manipulated text order (Kintsch, Mandel, & Kozminsky, 1977; Stein & Nezworski, 1978; Thorndyke, 1977) and

many of the more recent studies (Mandler & Goodman, 1982; Stein & Glenn, 1982) have used narrative texts that contained largely schema-based underlying structures.

One of the few studies that has investigated discourse organization of texts with purely model-based structures is the work of Ehrlich and Johnson-Laird (1982). In this paper, Ehrlich and Johnson-Laird propose a general principle of discourse organization (a principle of "referential continuity"). They hypothesize that text which is organized so that new information can be related to an already constructed model is easier to comprehend and recall than text organized so that new information cannot initially be related to an already constructed model. They carried out a series of experiments using descriptions of a spatial array and found that texts which violated the principle of referential continuity (e.g., "The knife is in front of the pot. The glass is behind the dish. The pot is on the left of the glass.") were harder to understand and remember than texts which obeyed the principle (e.g., "The knife is in front of the pot. The pot is on the left of the glass. The glass is behind the dish.").

In the next section, we extend the theoretical framework of Ehrlich and Johnson-Laird and propose a number of general principles of discourse organization. However, in doing this we propose principles that are in explicit opposition to some of the theoretical statements in Ehrlich and Johnson-Laird's paper. In particular, Ehrlich and Johnson-Laird (1982) proposed that if one has taken into account the principle of referential continuity, "The order in which sentences or referents occurred in the text has no bearing on the construction of the representation" (p. 298). In the next section we propose four principles of discourse organization and suggest how each principle is related to discourse comprehension.

Principles of Discourse Organization

The immediate integration principle. Discourse comprehension is facilitated by introducing new information in discourse in such a way that it can be integrated immediately into an already constructed underlying structure. For example, when a text has introduced underlying events E-2, E-3, and E-4, comprehension will be facilitated if the next event introduced is either E-5 or E-1 since they could be integrated immediately to the already established events. On the other hand, introducing E-6 at this point would violate the immediate integration principle because it cannot be integrated immediately. We assume that violations of this principle reduce comprehension by forcing the hearer/reader to hold information in working memory until it can be integrated into the developing structure. This psychological processing assumption has been included in a number of models of text comprehension (Ehrlich & Johnson-Laird, 1982; Kieras, 1978). Our immediate integration principle is essentially equivalent to Ehrlich and Johnson-Laird's principle of referential continuity. This principle can also be thought of as the discourse analogue of the given/new principle (Clark & Haviland, 1977) that has been proposed for sentence processing.

The consistency principle. Discourse comprehension is facilitated by organizing discourse so that new information is attached to an already constructed mental model in a consistent fashion. For example, with a text that has already introduced underlying events E-2, E-3, and E-4, the introduction of E-5, then E-6, and then E-7 would follow the consistency principle. On the other hand, introducing E-5, then E-1, then E-6 would violate the principle. In other words, this principle assumes the operation of the immediate integration principle but asserts that there should be a consistent locus where new information is being attached to the old mental model. We assume that the violation of this principle forces the hearer/reader to shift the locus of structure construction, with a possible drain of memory resources, leading to difficulty in the construction of the underlying structure.

The completeness principle. Discourse comprehension is facilitated by organizing discourse so that all new information for structure construction is given as required. For example, introducing three underlying events in the order E-2, then E-3, and then E-4 would be consistent with this principle. However, presenting the events in the order E-2, then E-4, and then E-3 would violate the

completeness principle. In this example, note that the immediate integration principle is not violated because E-4 can be temporarily integrated to an already constructed model, E-2, until the occurrence of E-3 signals the hearer/reader to revise the already constructed underlying structure. We assume that violations of this principle require the hearer/reader to reorganize already constructed underlying structure, leading to a shift in focus and possible confusions in structure construction.

The isomorphism principle. Discourse comprehension is facilitated by having discourse structure map isomorphically onto the underlying event structure. For example, introducing three underlying events in the order E-1, then E-2, and then E-3 would be consistent with the isomorphism principle, but introducing the events in reverse order E-3, then E-2, and then E-1 would violate the principle. This isomorphism principle is essentially identical with a principle of "experiential iconicism" proposed by Enkvist (1981) in which "elements of language are ordered to make a text isomorphic with the universe it describes" (p. 98). In order to apply this principle, one must, of course, have some knowledge about the structure of the information that underlies a particular form of discourse. This may be difficult for some types of discourse, such as expository texts, but is relatively straightforward for narrative texts. In fact, Brewer (1985) has proposed that a universal property of narratives designed primarily for comprehension is that "the order of events in the discourse will map the order of the underlying events" (p. 187). We hypothesize that violations of this principle make construction of the underlying structure by the hearer/reader more difficult.

We assume that the comprehension of narrative texts requires the construction of an appropriate underlying event sequence from the surface discourse structure. Therefore, we hypothesize that violations of any of these four principles of discourse organization will reduce the ability of the hearer/reader to construct the intended mental model of underlying event structure and lead to reduced comprehension.

Overall Experimental Plan

The goal of the present experiment was to examine the impact of violations each of the hypothesized principles of discourse organization on comprehension for the genre of narrative text. The basic approach was to establish a particular underlying event sequence, construct narrative texts with different discourse organizations from this event sequence (each violating different principles), and then test the difficulty of comprehension of each type of narrative organization. In keeping with the methodological arguments outlined above, we used passages with underlying event sequences that have no temporally predictable relations among events and have utilized the appropriate forms of discourse coreference to cohesive text. There were five types of passages each with a different discourse organization.

Canonical passages. In the canonical passages, the order of events in the narrative (e-1, e-2, e-3) was mapped directly onto the underlying event order (E-1, E-2, E-3). The discourse structure of canonical passages allows the immediate integration of new information, is consistent in the locus of mental model construction, maps isomorphically onto the underlying event structure and provides the needed information for the model construction as the hearer/reader requires it. This form of narrative organization follows all four principles and thus should be the easiest form of narrative passage to understand.

Backward passages. In the backward passages, the order of the events in the narrative was given in reverse order (e-3, e-2, e-1) from the underlying event order (E-1, E-2, E-3). This text manipulation violates the isomorphism principle since the narrative order does not map the direction of the underlying event order. The backward passages violate neither the immediate integration principle nor the consistency principle in mental model construction. The reader should be able to attach new information to the beginning of an already constructed mental model in an orderly manner, even though stories are told from the last event to the initial event in the underlying event sequence. Text organized in this fashion should be more difficult to understand than canonical passages.

Flashback passages. In the flashback passages, the order of events in the narrative was in canonical order but an event was omitted from the discourse and given later in the narrative (e-1, e-3, e-4, e-2). These passages were designed so that readers would initially be able to construct an underlying structure, E-1, E-3, and only later learn that it was necessary to insert E-2 into this already constructed model. This form of narrative organization violates the completeness principle because all of the information required for deriving the underlying structure was not given as needed. Text organized in this way should be more difficult to understand than canonical passages.

Embedded passages. In the embedded passages, the text began with an event from the middle of the underlying event sequence. The narrative continued with the next following underlying event; however, the narrative then gave the underlying event that preceded the initial event and continued in embedded form (e-3, e-4, e-2, e-5, e-1). This type of narrative organization violates the consistency principle because the locus of structure construction shifts from one end of the already constructed structure to the other. This organization also violates the isomorphism principle because half of the narrative events are given in reverse order from the underlying event order (E-1, E-2, E-3, E-4, E-5). Thus, this form of discourse organization should be more difficult to understand than canonical passages and probably should also be more difficult to understand than backward passages.

Flashforward passages. In the flashforward passages, the text started with the narrative events (e-1, e-2) given in canonical order. The narrative then introduced an event which occurred later in the underlying event sequence (e-5). Then, by describing the immediately following event (e-3), flashforward passages continued in canonical order (e-1, e-2, e-5, e-3, e-4). This form of discourse organization violates the immediate integration principle because the information in the flashforward portion (e-5) is new information that cannot yet be attached to an already constructed underlying event structure. Violations of the immediate integration principle for spatial descriptions (Ehrlich & Johnson-Laird, 1982) have been shown to have strong effects on comprehension. Therefore, this form of discourse organization should be the most difficult among the five forms of organization.

The discourse principles predict that the canonical passages should be the easiest to comprehend since they follow all the principles. The flashforward passages, which violate the crucial immediate integration principle, should be the most difficult. The embedded passages should be the next to most difficult since they contain violations of both the consistency principle and the isomorphism principle. There is no strong theory-motivated way to predict whether violations of the consistency principle or of the isomorphism principle should produce larger difficulties in comprehension. Thus, overall, the discourse principles can be used to predict that the order of difficulty for our experimental passages should be from the easiest to the most difficult: canonical, backward/flashback, embedded, flashforward.

Method

Subjects

The subjects were 100 college students who participated in the experiment to fulfill a course requirement.

Materials

Underlying events. Two underlying event sequences were developed: *A walk in the forest*, and *A day in the life of the president*. Each event sequence contained 14 events that were not structured in terms of script information or plan information. Thus, for example, in the *A day in the life of the president* event sequence, the first three events were: (1) PRESIDENT DECLARED NATIONAL PICKLE WEEK; (2) PRESIDENT MET WITH MISS AMERICA; (3) PRESIDENT WALKED IN ROSE GARDEN. A set of five narrative passages was developed from each event sequence. Each set contained one narrative with each of five different forms of global discourse structure: (a) canonical,

(b) backward, (c) flashback, (d) embedded, and (e) flashforward. The passages derived from the *A walk in the forest* sequence of events are given in the Appendix.

Canonical passages. Two passages with canonical narrative organization were developed, one from each underlying event sequence. The sentences describing the events used temporal markers such as "next," "after this," and "then" to establish discourse cohesion.

Backward passages. Two passages with backward narrative organization were developed, one from each underlying event sequence. Each sentence was related to the next with the initial phrase "before that."

Flashback passages. Two passages with flashback narrative organization were developed, one from each underlying event sequence. Three of the 14 underlying events were given in the text in flashback form. The event to be given in flashback form was omitted from the discourse where it would have occurred in canonical organization. Thus for the event sequence: (1) BEAR, (2) REDWOODS, (3) RAIN, the discourse was given as: "She heard a loud noise and turned to see a large black bear breaking into a cabin. A little later during the walk, the sky darkened and light rain began to fall." Later in the narrative, at the point where the flashback occurred in the discourse, cohesiveness was established by using appropriate tenses and by referring back to the event in the already established event structure that immediately preceded the omitted event, for example, "Earlier in the walk, right after she had seen the bear, Sara had walked through a grove of giant redwoods."

Embedded passages. Two passages with embedded narrative organization were developed, one from each underlying event sequence. The second sentence in the text introduced an event from the middle of the underlying event sequence. The third sentence in the text described the event that followed the middle event in the underlying event sequence. The next sentence used standard flashback discourse conventions (described above) to introduce the event that immediately preceded the middle event in the underlying event sequence. For example, "About halfway through her walk, she heard a loud noise and turned to see a large black bear breaking into a cabin [middle event in underlying event sequence]. After this, she walked through a grove of giant redwoods. Before she saw the bear, she had seen some people skinny-dipping in a small pond." The narrative continued by introducing new events into the text in alternating sequence. Discourse cohesiveness was maintained by the use of tense markers and by appropriate reference to the initial (or last) event of the already established event structure.

Flashforward passages. Two passages with flashforward narrative organization were developed, one from each underlying event sequence. Three of the 14 events were given in flashforward form. Each flashforward event and the event immediately preceding it in the underlying structure were introduced into the discourse (before their appropriate canonical positions) with an adverbial clause indicating an unspecified period of future time. For example, "Next, she saw a flock of geese heading south [event from established canonical event sequence]. Later in the day, after she had spotted a campfire [event immediately preceding flashforward event in underlying event sequence], she almost stepped on a rattlesnake while walking through a meadow [flashforward event]." Immediately after the flashforward event, the discourse reverted back to the original time line by introducing the next new event into the discourse with respect to the last event in the established event sequence. Thus, for the given example, the narrative continued with "However, immediately after she had seen the geese [established event], she met a hiker who told her that the west trail was impassable [next new canonical event]." When the discourse progressed to the point in the underlying event sequence where the flashforward event should be inserted, the event immediately preceding the flashforward event in the underlying event sequence was given, but not the flashforward event itself. Thus, for the above example, when the appropriate point was reached, the text stated "Next, Sara spotted the campfire up on the ridge. Later during the walk, Sara saw the moose crash through a grove of poplar trees."

Comprehension Test

Comprehension of the texts was measured by two sets of 20 true-false questions about the order of events in the underlying event sequences. Since the events in the underlying event sequences did not contain temporally predictable relations, it was necessary for the subjects to use the information given in the discourse to establish the underlying event sequences. The pairs of events to be tested were selected so that no item tested pairs of events which occurred next to one another in the underlying event sequence. The distances between the pairs of events in test materials were such that there were one to seven intervening events between the pairs of events in the underlying event sequence. Note that the comprehension test never tested information given in literal form in the text. The test items were always tests of subjects' inferences concerning underlying event order. Example test items for the *A walk in the forest* event sequence were: (T F) 1. "Sara saw the bear break into the cabin after she almost stepped on the rattlesnake."; (T F) 2. " Sara talked with the hiker before she walked through the redwood grove."

Procedure

The subjects were seen in small groups of 5 to 10. Each group listened to a tape recording of the passage twice and then answered the true-false questions for that passage.

Design

There were five types of discourse organization (canonical, backward, flashback, embedded, flashforward) and two underlying event sequences (*A walk in the forest*, *A day in the life of the president*) in a factorial design. Both factors were between subjects. There were 10 subjects in each experimental condition.

Results

The analyses were carried out on the number of correct responses on the 20-item comprehension tests, with maximum possible scores of 20 and a chance score of 10 correct. The means and standard deviations for each type of narrative organization are given in Table 1.

[Insert Table 1 about here.]

A two-way analysis of variance (Event Sequence x Narrative Organization) was carried out on the comprehension scores. There was a significant main effect of type of narrative organization ($F(4,90) = 12.03$, $MSe = 11.85$, $p < .001$). Neither the main effect of event sequences (*A walk in the forest* vs. *A day in the life of the president*) nor the interaction was significant. Thus, the narrative organization had a powerful effect on text comprehension.

In order to determine heterogeneous sets among passage types of discourse organization, we used a posteriori Newman-Keuls multiple range tests. Types of discourse organization were separated into three groups. The comprehension scores for the canonical passages (17.7) were significantly higher ($p < .05$) than the comprehension scores for all other types of discourse organization. There were no significant differences between the comprehension scores for the backward passages (14.9), the flashback passages (14.7), and the embedded passages (13.6). The comprehension scores for the flashforward passages (10.3) were significantly lower than those for all of the other types of discourse organization.

Discussion

These results show strong effects of global narrative organization on discourse comprehension. The results support each of the four principles of discourse organization as applied to narrative text.

The *immediate integration principle* states that discourse comprehension is facilitated by introducing new information so that it can be integrated immediately to an already constructed underlying structure. Violations of the immediate integration principle produced the largest effects of any of the discourse manipulations in this experiment, with three flashforward events reducing comprehension scores to essentially chance levels. The strong effect of violating the immediate integration principle is consistent with previous studies of discourse comprehension (Ehrlich & Johnson-Laird, 1982; Kieras, 1978) and suggests that discourse organizations that place a heavy load on working memory have particularly disruptive effects on comprehension.

The *consistency principle* states that discourse comprehension is facilitated by organizing discourse so that new information is attached to old underlying structure with a consistent locus. The finding of reduced comprehension scores for the embedded texts supports this principle, since these texts violate the consistency principle by shifting the focus of structure construction back and forth from one end of the established structure to the other. However, this interpretation is not completely unambiguous, since the embedded texts also violate the isomorphism principle.

The *completeness principle* states that discourse comprehension is facilitated by organizing discourse so that all new information is given as required. The finding of reduced comprehension scores for the flashback passages supports this principle, since the flashback texts omit relevant information and then insert the missing information into the already constructed event sequence. It is interesting to note the contrast between flashforward texts which violate the immediate integration principle and flashback texts which violate the completeness principle. It appears that the extra memory load involved in violating the immediate integration principle is particularly important for comprehension, and so flashforward texts are more difficult to comprehend than flashback texts.

The *isomorphism principle* states that discourse comprehension is facilitated by having discourse structure map underlying structure. The finding of reduced comprehension scores for the backward texts supports this principle, since these texts obey the immediate integration principle, the consistency principle, and the completeness principle, but violate the isomorphism principle. It appears that subjects find it harder to construct an underlying directional event sequence when the events are presented in the discourse in the reverse order.

Linear Ordering and Discourse Organization

This experiment was developed within the general theoretical framework of humanistic studies of text (Chatman, 1978; Erlich, 1980) and more specifically within the framework of the experimental study of discourse (van Dijk & Kintsch, 1983; Graesser, 1981; Johnson-Laird, 1983). However, the processes postulated to underlie the effects of global discourse organization on comprehension are presumably general cognitive processes that are brought into operation during the process of text comprehension. Thus, it is interesting to compare the results of these experiments with an independent line of research on linear ordering.

There is a fairly large literature on the psychological processes involved in making comparative judgments (Potts et al., 1978). Within this literature one popular research paradigm has been the study of four-term linear order problems. An example of a four-term linear order problem is: "The doctor is taller than the farmer. The farmer is taller than the soldier. The soldier is taller than the teacher." The subject can then be asked questions about the relative heights of a pair of individuals or be asked to recall the entire set of sentences. Within this literature, there is one set of studies that seem to tap many of the same psychological processes as the experiment in this paper. These experiments used an arbitrary underlying linear ordering (as in the above example) and studied all possible ordering of the three pairs (Foos, Smith, Sabol, & Mynatt, 1976; Smith & Foos, 1975). Thus, if the above example is represented as AB, BC, CD then this ordering of the three pairs is equivalent to our *canonical* discourse organization. The order, CD, BC, AB would be equivalent to our *backward* discourse organization. The order BC, CD, AB would be equivalent to our *flashback*

organization. Note that in this case the pair AB is moved from its canonical location. The first two pairs BC, CD build up an underlying structure and finally the omitted pair is attached to the beginning of the already constructed structure as in a flashback narrative. Finally, the order AB, CD, BC is equivalent to our *flashforward* organization. In this case the second pair does not attach new information to the already constructed structure and so must be held in working memory. It is only with the final pair that the underlying structure can be constructed. Thus, this ordering is equivalent to a narrative text with a single flashforward.

Examination of the recall data in Smith and Foos (1975) and Foos, Smith, Sabol, and Mynatt (1976) shows that the linear order equivalent of our canonical organization gives higher recall than any of the other orders. The linear orderings that correspond to our backward and flashback organization are below the canonical ordering and show roughly equivalent recall. Finally, the linear ordering that corresponds to our flashforward organization shows the lowest recall of any of the orders. This patterning of the linear order data is the same as our results for the comprehension scores for the appropriate discourse organizations. This unusual degree of consistency across rather different experimental paradigms suggests that both tasks are, in fact, tapping the same underlying cognitive processes.

The Function of Discourse Organization

The finding that a number of violations of canonical discourse organization will reduce comprehension leads to an obvious puzzle. Why don't authors always write texts in canonical form? This paradox only arises if one assumes that all texts are designed to optimize comprehension. Brewer (1980) has argued that while some discourse genres are designed primarily for comprehension (e.g., newspaper articles) other genres are designed primarily for functions, such as entertainment or persuasion. Thus, an author's use of a noncanonical discourse organization is not so puzzling if it contributes to some discourse function other than comprehension. In fact, several authors in the humanistic tradition have analyzed the functions of discourse organization in these terms. For example, both Sternberg (1978) and Genette (1972/1980) have argued that flashforwards are used to build up suspense in the reader about events that are yet to come. Brewer and Lichtenstein (1981; 1982) have carried out a series of psychological experiments showing that discourse organization can have large effects on the reader's affect and liking judgments for narratives. Thus, it appears that authors may choose a particular form of discourse organization that is not the most efficient form for comprehension if that form has some other important discourse function.

Conclusions

Overall, this experiment suggests the importance of a careful distinction between underlying events and the representation of these events in discourse. It provides evidence that there are powerful effects of global discourse organization on comprehension and, more specifically, it supports the immediate integration principle, the consistency principle, the completeness principle, and the isomorphism principle, as applied to narrative discourse.

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Table 1

Mean Comprehension Scores for Each Type of Passage Organization

Passage Type	Comprehension Score	
	M	SD
Canonical	17.7	2.0
Backward	14.9	5.0
Flashback	14.7	3.2
Embedded	13.6	4.1
Flashforward	10.3	2.0

(Maximum score = 20, chance score = 10)

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Appendix: Experimental Passages (A walk in the forest)

Canonical Passage

It was a beautiful afternoon, so Sara decided to walk through the forest. While walking, she noticed the remains of the old ranger station. Next, she saw a flock of geese heading south. She then met a hiker who told her that the west trail was impassable. After this, Sara went to her favorite spot, a cliff which overlooked a small village, and sat for a while. Next, she saw some people skinny-dipping in a small pond. Hearing a loud noise, she turned to see a large black bear breaking into a cabin. After this, she walked through a grove of giant redwoods. Then the sky darkened and a light rain began to fall. Next, Sara spotted a campfire up on the ridge. Then, while walking through a meadow, she almost stepped on a rattlesnake. After this, Sara saw a moose crash through a grove of poplar trees. Sara then circled around Bald Mountain in order to go down into the valley. Finally, Sara followed the Kern River back home.

Backward Passage

The last thing Sara did the day she walked in the forest was to follow the Kern River back home. Before that, Sara had circled around Bald Mountain in order to go down into the valley. Before that, Sara had seen a moose crash through a grove of poplar trees. Before this, while walking through a meadow, she had almost stepped on a rattlesnake. Before that, Sara had spotted a campfire up on the ridge. Before this, the sky had darkened and a light rain began to fall. Before that, she had walked through a grove of giant redwoods. Before this, she had heard a loud noise and turned to see a large black bear breaking into a cabin. Before that, she had seen some people skinny-dipping in a small pond. Before this, Sara had gone to her favorite spot, a cliff which overlooked a small village, and sat for a while. Before that, she had met a hiker who told her that the west trail was impassable. Before this, she had seen a flock of geese heading south. Before that, while walking, Sara had noticed the remains of an old ranger station. Right before this, Sara had decided to walk through the forest since it was a beautiful afternoon.

Flashback Passage

It was a beautiful afternoon, so Sara decided to walk through the forest. Shortly afterward, Sara saw a flock of geese heading south. Next, she met a hiker who told her that the west trail was impassable. A little later in the day, Sara saw some people skinny-dipping in a small pond. After this, she heard a loud noise and turned to see a large black bear breaking into a cabin. A little later during the walk, the sky darkened and a light rain began to fall. Then, Sara spotted a campfire up on the ridge. Earlier in the walk, right after she had seen the bear, Sara had walked through a grove of giant redwoods. Immediately after she had spotted the campfire on the ridge, Sara almost stepped on a rattlesnake while walking through the meadow. Next, Sara saw a moose crash through the grove of poplar trees. Considerably earlier in the walk, right after she had met the hiker, Sara had gone to her favorite spot, a cliff which overlooked a small village, and sat for a while. Immediately after she had seen the moose, Sara circled around Bald Mountain in order to go down into the valley. Much earlier in the walk, right after she had decided to walk through the forest, Sara had seen the remains of an old ranger station. Finally, immediately after circling Bald Mountain, Sara followed the Kern River back home.

Embedded Passage

It was a beautiful afternoon, so Sara decided to walk through the forest. About half way through her walk, she heard a loud noise and turned to see a large black bear breaking into a cabin. After this, she walked through a grove of giant redwoods. Before she saw the bear, she had seen some people skinny-dipping in a small pond. Immediately after she had walked through the redwood grove, the

sky darkened and a light rain began to fall. Earlier, just before she saw the people skinny-dipping, she had gone to her favorite spot, a cliff which overlooked a small village, and had sat for a while. Right after the light rain had began, Sara spotted a campfire up on the ridge. Just before she had gone to her favorite spot, she had met a hiker who told her that the west trail was impassable. Later, right after she had noticed the campfire, she almost stepped on a rattlesnake while walking through a meadow. Earlier, just before she met the hiker, she had seen a flock of geese heading south. Right after almost stepping on the rattlesnake, Sara saw a moose crash through a grove of poplar trees. Earlier, just before she saw the flock of geese, she had noticed the remains of the old ranger station. Right after she had seen the moose, Sara circled around Bald Mountain in order to go down into the valley. Finally, Sara followed the Kern River back home.

Flashforward Passage

It was a beautiful afternoon, so Sara decided to walk through the forest. Later during the walk, after she had seen a moose, Sara circled around Bald Mountain in order to go down into the valley. However, right after she began the walk, she noticed the remains of the old ranger station. Next, she saw a flock of geese heading south. Later in the day, after she had spotted a campfire, she almost stepped on a rattlesnake while walking through a meadow. However, immediately after she had seen the geese, she met a hiker who told her that the west trail was impassable. After this, Sara went to her favorite spot, a cliff which overlooked a small village, and sat for a while. Later in the day, after she had seen a bear, she walked through a grove of giant redwoods. However, immediately after she went to her favorite spot on the cliff, she saw some people skinny-dipping in a small pond. Then, she heard a loud noise and turned to see the large black bear breaking into a cabin. Later during the walk, the sky darkened and a light rain began to fall. Next, Sara spotted the campfire up on the ridge. Later during the walk, Sara saw the moose crash through a grove of poplar trees. Finally, Sara followed the Kern River back home.